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ABSTRACT
Local governments can increase size in particular policy fields through cooperation with other local governments. This is often thought to improve efficiency, but there is little empirical evidence supporting this hypothesis. We study the case of the Netherlands, which has been a veritable laboratory of intermunicipal cooperation (IMC), using panel data for 2005–2013. We find no evidence that IMC reduces total spending of the average municipality. Indeed, IMC seems to increase spending in small and large municipalities, leaving spending in mid-sized municipalities unaffected. In one specific field, tax collection, spending may be reduced through IMC. Spending in this field is low, which may explain why total spending is unaffected. Instead of lowering spending, municipalities may have used possible cost savings as a result of IMC to improve public service levels. We do not find evidence substantiating this hypothesis, however.

KEYWORDS Intermunicipal cooperation; public spending; efficiency; public services; economies of size

Introduction

According to Oates' (1972) theorem, assigning the task of providing public services to subnational jurisdictions increases welfare, because it allows services to be tailored to local preferences. Allowing every community to choose its own mix of public services and taxes results in higher welfare than nationally uniform service provision. Decentralised service provision is not without disadvantages, however. The production of public services may be characterised by economies of size. Moreover, spillovers to neighbouring municipalities may distort the local trade-off of costs and benefits. As a result, optimal jurisdiction size is different for different public services.

In practice, local governments have found two ways around this problem. In the first place, the production of many public services is contracted out to private firms which, by working for more than one local jurisdiction, can operate at a larger scale. Alternatively, public–private partnership may be

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Supplemental material for this article can be accessed here.

used. Contracting out requires a competitive market, which does not exist for all services for which local governments are responsible. In practice, results of contracting out and public–private partnership are often disappointing (Bel, Fageda, and Warner 2010; Andrews and Entwistle 2010).

In the second place, local governments can cooperate with other local governments to provide public services. Intermunicipal cooperation (IMC) has become widespread, both in Europe and in the US. IMC may help municipalities that are simply too small to perform every task independently. IMC is often introduced with the aim of realising size-related efficiency gains (Hulst and Van Montfort 2007; Bartolini and Fiorillo 2011; Teles 2016). Indeed, it is often the need to cut cost that instigates cooperation (Kwon and Feiock 2010; Bel and Warner 2016). However, the cost-cutting potential of IMC is, so far, nothing more than an assumption. The effects of IMC on government spending and efficiency are not yet extensively studied.

In theory, IMC may improve efficiency if the production of public services is characterised by economies of size. In larger organisations, fixed costs can be spread out over higher production volumes, and a more extensive division of labour may improve productivity. On the other hand, corporate governance theory predicts that IMC increases agency (or transaction) costs and reduces the extent to which public servants are monitored (Allers and van Ommeren, 2016; Van Genugten 2008). To begin with, IMC introduces an extra tier in the hierarchy: the board of the intermunicipal organisation (IO). This increases monitoring costs. Second, monitoring is reduced because a local government has a weaker grip on an IO than on its own organisation. Finally, IMC reduces the incentive to monitor because the costs are borne by the local government doing the monitoring, while the benefits are spread over all participating municipalities (common pool problem). Thus, corporate governance theory predicts that possible efficiency gains from IMC will be at least partly offset by losses through increasing monitoring costs and the resulting reduction in monitoring.

Applying public choice theory results in a prediction in the opposite direction (Sørensen 2007). In this view, citizens are unable to effectively monitor their elected administrators, who will exploit this by using public resources to further their own interests (rent seeking). Because politicians are further removed from decision-making within IOs, and because politicians from more than one municipality are involved, it is probably more difficult for a particular politician to misuse an IO's resources. Thus, IMC could be efficiency enhancing, even if no economies of size exist.

Because theory does not provide a clear prediction, the question whether IMC improves efficiency needs to be answered empirically. However, relatively few studies exist, and most focus on a single public service (garbage collection). This study adds to the literature by studying the effects of IMC in the Netherlands, which, in the past decades, has seen a surge of IMC in different policy fields, making this country an ideal testing ground. Our main analysis studies the effect of IMC on total per capita municipal spending. We start by measuring IMC by the amounts municipalities spend through IOs. In additional regressions, we measure IMC using dummy variables indicating whether municipalities cooperate in certain policy areas, and by the increase in size (measured by population) as a result of IMC. Because small municipalities are more likely to profit from scale increases than large municipalities (Bel and Warner 2015), we also test whether our results vary by municipality size.

Next, we study the effect of cooperation in one particular policy field, tax collection, in more detail. We single out this field because the capital-intensive nature of tax collection leads us to expect that savings from IMC, if they exist, would be especially likely here. Because the share of tax collection spending in total spending is low, we do not use total municipal spending as a dependent variable here, but tax collection spending.

Our results indicate that IMC does not reduce municipal spending, with the exception of joint tax collection. Because tax collection costs are a minor item on the municipal budget, it is not surprising that these savings do not noticeably impact total spending. However, the outcome that cooperation does not reduce aggregate spending does not necessarily imply that IMC does not improve efficiency. Instead of using cost savings to lower spending, municipalities may use them to finance more or better public services. Therefore, we also look for evidence of an effect of IMC on public service levels.

Unfortunately, municipal service provision cannot be measured directly. Instead, we use changes in house prices as an indicator for changes in service levels. This is based on a vast economic literature which indicates that amenities like schools, parks and shopping centres (and disamenities like noise and pollution) capitalise into house prices (see, e.g., Fishel 2001, and the references therein). Homebuyers are prepared to spend more in locations that have more to offer. Municipalities are important providers of amenities, although certainly not the only ones. Previous empirical studies have established that higher intergovernmental grants to municipalities result in higher house prices, both in England (Hilber, Lyytikäinen, and Vermeulen 2011) and in the Netherlands (Allers and Vermeulen 2016). With more money to spend, municipalities can afford more or better public services and become more attractive to homebuyers. From this literature, we take the notion that (potential) savings resulting from IMC may be spent, just like extra grant money, on public services which capitalise into house prices. However, our empirical analysis shows no effect of IMC on house prices, implying that we find no evidence of efficiency gains attained through IMC.

Previous empirical studies

Considering the fact that municipal cooperation is widespread, the dearth of empirical studies into its financial effects is surprising. Of the few empirical studies available, most focus on a single public service. Bel and Warner (2015) survey the literature and find eight econometric studies of the effect of IMC on public service cost or spending. All focus on solid waste services, in one case combined with water, electricity and gas provision. The results were mixed; both positive, negative and insignificant results are reported. Blaeschke and Haug (2014) study the effect of IMC on efficiency in waste-water disposal in a German state. They find that economies of size are limited, and that IMC is characterised by lower technical efficiency than self-provision.

In the Netherlands, cooperation in the fields of tax collection and solid waste collection has been studied. Niaounakis and Blank (2017) conclude that IMC increases cost-efficiency in tax collection. Dijkgraaf and Gradus (2013) find that IMC reduces spending on garbage collection (although only at the 10% confidence level). In a later study, Dijkgraaf and Gradus (2015), this effect disappears.

A different approach was taken by Allers and van Ommeren (2016): instead of studying all costs of providing a single service, they focus on a single cost (credit) in a broad range of public services. The authors conclude that, in the Netherlands, IOs pay higher interest rates than municipalities, while there is no economic reason to do so. As the benefits of lower interest rates outweigh the extra bargaining cost they would require, the higher interest paid by IOs is interpreted as a form of inefficiency. The number of participating municipalities did not seem to affect the interest rate paid by an IO. Thus, it is cooperation as such that affects efficiency, not the number of parties involved. Allers and van Ommeren (2016) conclude that the most probable explanations are the introduction of extra hierarchical layers through IMC, and the limited influence of municipality governments on IO boards.

Still, a different approach was chosen by Frère, Leprince and Paty (2014), who study the effect of IMC on total spending of French municipalities. They find no effect, either positive or negative. This outcome is similar to that of studies of the budgetary effects of municipal amalgamation. Recent studies in the Netherlands (Allers and Geertsema 2016) and Denmark (Blom-Hansen et al. 2016) found no effect of amalgamation on total municipal spending. Earlier studies found either higher or lower spending after amalgamation (see Allers and Geertsema 2016, for references).

That amalgamation does not seem to affect spending may not come as a surprise. Amalgamation does not necessarily change the operating scale of the organisational units that produce public services (Blom-Hansen et al. 2016). It does not automatically result in, e.g., bigger schools or bigger medical centres. Cooperation is different in this respect: it is aimed specifically at production units, not administrative units. Therefore, in fields where economies of size exist, cooperation may be a better way to exploit these.

Institutional set-up

The Netherland has 408 municipalities (in 2013). These are democratically governed jurisdictions with considerable autonomy over spending decisions, carrying out a broad range of government tasks. Municipalities spend about 10% of GDP. In the last decades, various public responsibilities have been transferred from the central to the local government level. As a result, the focus of municipalities' activities has shifted from infrastructure to social services. With over 40,000 inhabitants on average, Dutch municipalities are relatively large. This is due to municipal amalgamation. In the last decades, municipalities have been transferring an ever-increasing part of their activities to IOs.

IOs are funded by the participating municipalities. IOs do not levy own taxes. In some cases, IOs receive an intergovernmental grant from the central government. However, participating municipalities are responsible should any financial deficits arise. Municipalities are free to enter or leave IOs, except in a few well-defined policy areas where IMC is mandatory, e.g., fire protection. IMC takes different forms (Hulst and Van Montfort 2007). Under the Joint Provisions Act, municipalities may create *public bodies*. These are separate administrative entities that may employ staff, own assets and borrow money. Municipalities may also create *public companies* under private law. Several other kinds of IMC exist as well, such as foundations and informal consultative bodies.

Data

We use panel data from 2005 to 2013. Amounts are per capita, expressed in euros of 2013 using the consumer price index. For the econometric analysis, all variables except dummies are converted into logarithms. We rebuilt the data set in such a way that amalgamations are retroactively applied to the data. To this end, we used municipalities as they existed in 2013 as units of observation, and for earlier years combined data from municipalities that merged within our data period.

IMC is measured in different ways. In our main analysis, we use IMC spending per capita as an explanatory variable. IMC spending is calculated by adding the amount a municipality spends on IO governance to the amount it transfers to other subnational government units, both according to its own accounts as reported by Statistics Netherlands.[1] Data on total municipal spending and on population size are taken from Statistics Netherlands as well. For some municipalities, spending data are not available for all years in our research period (see Table 1).

Figure 1 shows IMC spending in our research period. IMC spending per capita (left-hand panel in Figure 1) increased sharply from 2005 to 2008. After that, the economic crisis caused an overall reduction in local government spending. Per capita IMC expenditure increases with municipality size. As a share of total spending (right-hand panel in Figure 1), IMC spending has been

Table 1. Descriptive statistics.

	(1) Observations	(2) Mean	(3) Standard deviation	(4) Minimum	(5) Maximum
Dependent variable					
Total expenditure	3332	2475	13.1	736	7097
Spending on tax collection	3362	22.7	0.19	0.03	198
Cooperation variables					
IMC spending	3441	367	3.95	0.48	1806
D_{welfare}	3443	0.33	0.008	0	1
S_{welfare}	3443	2.21	0.04	1	19
$D_{\text{garbage collection}}$	3443	0.43	0.008	0	1
$S_{\text{garbage collection}}$	3443	7.60	0.37	1	433
$D_{\text{tax collection}}$	3443	0.18	0.007	0	1
$S_{\text{tax collection}}$	3443	3.12	0.12	1	77
Control variables					
Intergovernmental grant	3401	776	3.1	298	2783
Inhabitants	3443	37,471	722	932	505,568
Address density	3442	0.96	0.01	0.11	4.7
Welfare share	3442	0.026	0.0002	0.0066	0.08
Share of left-wing parties	3442	0.49	0.004	0	1
Political fragmentation	3442	0.21	0.0009	0.096	0.59
Share of coalition in council	3442	0.62	0.002	0.24	0.97
Pre-election year	3443	0.32	0.008	0	1
Election year	3443	0.22	0.007	0	1
Post-election year	3443	0.22	0.007	0	1

Amounts are per capita, expressed in euros at 2013 prices.

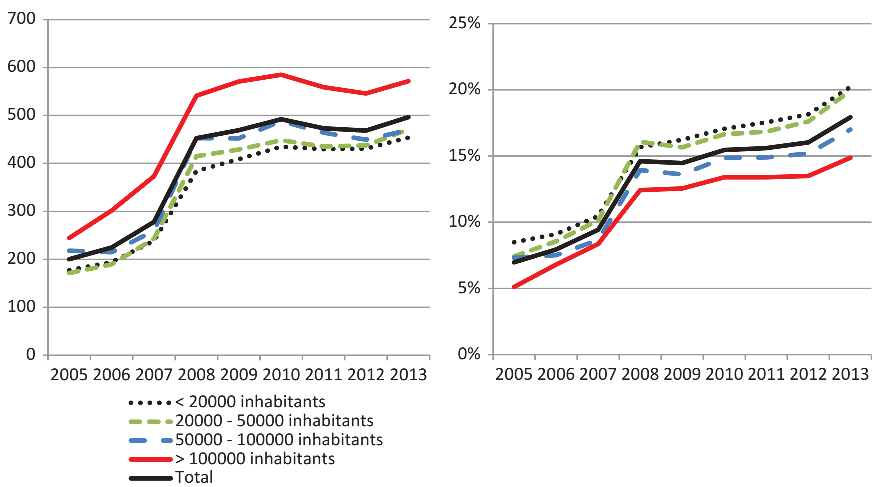

Figure 1. IMC spending in euro per capita (left) and as percentage of total spending (right) for different municipality sizes.

increasing from 7% on average in 2005 to 18% in 2013. The trend has been similar for municipalities of different sizes, but the levels differ. The share of IMC in total spending decreases with municipality size.

For four individual policy fields (welfare provision, sheltered work, garbage collection and tax collection), we collected data on cooperation. We used several publicly available data sets that provide data on some IOs in some years and extended these data through a survey among all municipalities. We kept sending reminders until we had data for all municipalities. We use these data to construct dummy variables indicating whether a municipality cooperates in a particular field, indicated (for welfare) as D_{welfare}. For each policy field, we also create a variable reflecting the size increase through IMC, indicated (for welfare) as S_{welfare}. This increase is calculated as the number of inhabitants served by the relevant IMC divided by the number of inhabitants of the municipality itself. The merit of this variable is that it can differentiate between municipalities attaining large and small size increases through cooperation, relative to their own size.

We found that IMC in sheltered work provision shows little variation: virtually, all municipalities cooperate. Therefore, we drop IMC variables related to sheltered work from our data set. Together, the three remaining policy fields, welfare, garbage collection and tax collection, involve 19% of Dutch municipal spending in 2013.

The data set is enriched with several control variables. These include per capita non-earmarked grants received from the central government ('algemene uitkering'), number of inhabitants, address density and share of inhabitants on welfare (all from Statistics Netherlands). We also use several political control variables: the share of left-wing parties in the municipal council, the Herfindahl index of political fragmentation, the share of the parties forming the local coalition in the municipal council and three dummy variables indicating whether the previous year, the current year or the year after that is an election year (source: Centre for Research of Local Government Economics). Table 1 presents descriptive statistics.

Model and econometric issues

The most straightforward model we use is the standard fixed effects model:

$$E_{i,t} = \beta x'_{i,t} + \gamma \theta_t + \delta_i t + \mu_i + \varepsilon_{i,t} \tag{1}$$

where $E_{i,t}$ is total per capita expenditures for municipality i in year t, $x'_{i,t}$ is a matrix of explanatory variables, θ_t is a year dummy, t is a municipality-specific linear time trend accounting for local trends, μ_i is a municipality-specific fixed effect accounting for invariant local contextual influence that is not measured by our model and $\varepsilon_{i,t}$ is a component for potential idiosyncratic shocks.

However, municipal expenditures are highly dependent on spending levels in previous years, because important expenditure categories like wage costs, interest and depreciations can only change gradually over time. Therefore, our main model includes a lagged dependent variable:

$$E_{i,t} = \alpha E_{i,\, t-1} + \beta x'_{i,t} + \gamma \theta_t + \mu_i + \varepsilon_{i,t}. \tag{2}$$

Estimation of such a dynamic model involves several econometric issues. First, with an OLS estimator, the lagged dependent $E_{i,\,t-1}$ would be correlated with the fixed effects and introduce a dynamic panel bias (Nickell 1981). Second, for our data set, $x'_{i,t}$ does not strictly consist of exogenous variables. IMC spending is linked to total municipal spending since it is part of the municipal budget. Moreover, we cannot rule out reverse causality. Dutch municipalities have been under pressure to increase efficiency. Thus, expenditure levels may influence the desire to cooperate. To the best of our knowledge, there are no valid external instruments available for these variables, so endogeneity problems can only be dealt with by drawing instruments from our existing data set.

To deal with these issues, we use the General Method of Moments (GMM), which is specifically designed and widely used to estimate dynamic models using panel data sets with a large N and a small T, such as ours (Roodman 2009). The standard GMM method, also referred to as difference GMM, transforms the model using first differences and changes it into a system of equations, where each time period has its own equation and set of lagged differences used as instruments. This resolves the Nickell bias because it expunges fixed effects from the model, and it allows for the formation of instruments from earlier observations of the differences.

Main analysis

The full model (before GMM transformation) that we use in conjunction with the difference GMM approach is the following:

$$E_{i,t} = \alpha E_{i,\,t-1} + \beta x'_{i,t} + \delta x'_{i,t} + \gamma\theta_t + \mu_i + \varepsilon_{i,t}. \tag{3}$$

The difference with Equation (2) is that $x'_{i,t}$ is now a matrix of strictly exogenous control variables, while $w'_{i,t}$ is a matrix of potentially endogenous variables, which in the main analysis contains one variable: IMC spending. After differencing this becomes

$$\Delta E_{i,t} = \alpha\Delta E_{i,\,t-1} + \Delta\beta x'_{i,t} + \Delta\delta w'_{i,t} + \Delta\gamma\theta_t + \Delta\varepsilon_{i,t}. \tag{4}$$

The μ_i term is expunged because it is time invariant, and the dynamic panel bias is removed. $\Delta E_{i,\,t-1}$ and $\Delta\delta w'_{i,t}$ will be instrumented by $\Delta E_{i,\,t-2}$ and $\Delta\delta w'_{i,t-2}$, respectively, and earlier lags of these two terms, to avoid correlation with the $v_{i,t-1}$ term in $\Delta v_{i,t}$. The year dummies and the exogenous control variables enter the instrument matrix in traditional IV-style as a transformed single column.

Due to the risk, inherent to GMM, of overfitting instrumented variables, we take several precautions (Roodman 2009). We limit the number of lags used to instrument the lagged dependent and the endogenous variables.

We also run regressions with 'collapsed' instrument matrices to confirm whether results are robust. Furthermore, we test for first and second-order autocorrelation using the Arellano–Bond autocorrelation test, and we test instrument validity using Hansen and Difference-in-Hansen tests.

Analysis using alternative measures of IMC

The next step in our analysis is to replace per capita IMC spending by sets of variables that measure IMC within three different policy fields, as described in the Data section. We take this extra step to test whether the results are robust to measuring IMC in different ways. First, we use dummy variables indicating cooperation in the three policy fields; next, we use variables that measure the size increase attained through cooperation.

There is no solid theoretical basis to predict whether these extra IMC variables are exogenous or not. Municipalities with higher spending levels could be more likely to start cooperating in multiple policy fields to reduce costs. However, it could also be argued that reverse causality between total spending and the decision to cooperate in a given policy field might be unlikely, since high spending is just as likely to be caused by problems in different policy fields. For size increase, the influence of total spending on IO size relative to the municipality's own size is arguably even less likely, as IO size depends on the availability of potential cooperating partners and their size. To account for both options – exogeneity and endogeneity – we run both regressions where the sets of IMC variables are treated as part of the matrix of exogenous variables $x'_{i,t}$, and regressions where we include them in the matrix of endogenous variables $w'_{i,t}$.

Do effects of IMC depend on jurisdiction size?

Several authors have shown that the effect of IMC may depend on the size of a municipality (Bel and Fageda 2006; Bel and Mur 2009). We estimate the influence of municipality size on the effect of IMC by introducing interaction terms to our main analysis, as part of the matrix containing potentially endogenous variables, $w'_{i,t}$.

Effect of IMC on collecting taxes

As another extension, we repeat the analysis with the dummy and size increase variables for tax collection, but this time, we do not use total spending, but spending on tax collection as a dependent variable. This is possible because, for this policy field, sufficient data on spending and on control variables are available. Tax collection, which includes property assessment, is an interesting field because it is highly automated, which means that any efficiency gains of IMC are most probably found here.

However, as spending in this field is low as a percentage of total municipal spending (0.4%), this may not show up as an effect of IMC on total spending.

Effect of IMC on service levels

Instead of lowering expenditures, efficiency gains as a result of IMC could present themselves in the form of improved service provision in the areas where municipalities cooperate. Additionally, municipalities could choose to use any financial gains through IMC to improve service provision in other areas. In both cases, a failure to find lower spending after IMC could lead to the false conclusion that no efficiency gains have been realised. In an attempt to shed some light on this, we extend the main analysis by replacing the dependent variable, total spending, with an indicator for municipal service provision. Unfortunately, public service levels cannot be measured directly, partly because municipalities produce a plethora of outputs, many of which are diffuse, and partly because output data on potentially quantifiable services are not always available. Using only output data on the few services where output can be measured, e.g. garbage collection, would seriously compromise our exercise, as these services are clearly not representative for the entire municipal output.

To circumvent this problem, we use the notion that public services make a municipality more attractive to potential homebuyers. Recent empirical studies in England and in the Netherlands show that changing intergovernmental grants to municipalities result in corresponding changes in house prices (Hilber, Lyytikäinen, and Vermeulen 2011; Allers and Vermeulen 2016). Presumably, extra grant money is used to improve public services which capitalise into house prices. The same may be true for money saved through IMC. Following Allers and Geertsema (2016), we estimate a hedonic regression of house prices on a large selection of house characteristics, using data on all housing transactions over our period of observation that were conducted by members of the Dutch Association of Realtors (NVM), which covers the majority of all owner-occupied housing transactions in the Netherlands.[2] Using the regression results, we calculate the mean price of a house with average characteristics. The resulting variable reflects the value, for every year in our data set, of a location in a particular municipality. Changes in service levels may result in changes in this value.

This standardised house price is then used as our dependent variable to substitute total spending. We estimate a dynamic fixed effects model as given in Equation (2) with the bias-corrected Least square dummy variable (LSDV) method (Kiviet 1995). Control variables are left out here because contemporaneous changes in socio-economic composition may be driven by changes in house prices, so that variables that correlate with socio-economic composition are 'bad controls' (Angrist and Pischke 2009).

Because the level of service provision might influence the desirability of cooperation, we also use GMM to estimate a model as described by Equation (4), where IMC spending is part of the matrix of endogenous variables $w'_{i,t}$.

Results

Table 2 presents results from our analysis of the effect of IMC on total municipal spending. The first Column shows the results from a fixed effects regression, without lagged dependent variable, as described in Equation (1). The coefficient of IMC spending is positive and significant. Using GMM according to Equations (3) and (4) does not change this coefficient, but it does not significantly differ from zero any more (Column 2). Adding control variables hardly affects the coefficients of IMC spending or their significance (Columns 3 and 4).

We believe the GMM model in Column 4 to be the most suitable for our main analysis, given the available data and the potentially endogenous nature of the IMC spending variable.[3] Specification tests confirm the validity of the estimation approach.[4] Repeating Regression 4 with collapsed instrument matrices confirms that the GMM results are robust (Appendix 2a in the Supplemental material). The lagged-dependent variable is strongly significant, as expected.[5] The control variables show coefficients that are unsurprising for differenced models using within-variation. Because they are not very informative, we do not report standard control coefficients in the remainder of this paper.

Our regressions show that IMC spending does not have a robust significant effect on total municipal spending. More specifically, when the levels of IMC expenditures increase or decrease, there is no statistically significant corresponding change in the levels of total expenditures. The coefficients are positive in every regression, but not statistically significant when GMM is used. In general, IMC does not seem to be an effective method to reduce spending for Dutch municipalities.

It is conceivable, however, that it takes time before municipalities manage to achieve any potential benefits of IMC. Therefore, we repeat the regressions in Table 2, using lagged IMC spending. With either 1 or 2-year lags for IMC spending, regressions still show an effect that is not significantly different from zero (Appendix 2b in the Supplemental material). Apparently, no spending reductions materialise 1 or 2 years after increasing IMC spending.

Results using different measures of IMC

The first three columns of Table 3 present the results of regressions similar to those in Table 2, where the dependent variable, IMC spending, is replaced

Table 2. Effect of IMC on total municipal spending.

	(1)	(2)	(3)	(4)
	Fixed effects no controls	GMM no controls	Fixed effects all controls	GMM all controls
Lagged dependent		0.19***		0.19***
		(4.93)		(4.84)
IMC spending	0.04***	0.04	0.04***	0.05
	(4.01)	(1.15)	(4.07)	(1.44)
Intergovernmental grant			0.01	−0.05
			(0.11)	(−0.42)
Inhabitants			−0.16	−0.55
			(−0.30)	(−1.50)
Address density			−0.14	−0.06
			(−0.53)	(−0.23)
Welfare share			−0.01	−0.04
			(−0.20)	(−1.09)
Share of left-wing parties			−0.02	0.00
			(−0.95)	(0.07)
Political fragmentation			−0.04	0.00
			(−1.36)	(0.02)
Share of coalition in council			0.00	0.01
			(0.07)	(0.34)
Pre-election year			0.03	0.04**
			(1.25)	(2.18)
Election year			0.03	0.05
			(0.84)	(1.09)
Post-election year			0.06**	0.05*
			(2.10)	(1.88)
Observations	3331	2474	3297	2450
Municipalities	392	392	388	388
Instruments		33		43
Hansen df		24		24
Hansen χ^2 value		20.3		19.9
Hansen p value		0.68		0.70

Variables are expressed in logarithms; z-statistics based on robust standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. See Appendix 2a in the Supplemental material for collapsed results for Column 4.
GMM: General Method of Moments.

by dummies indicating cooperation in three different policy areas. Columns 4–6 show the results of regressions with the IMC-induced size increase of service provision for these policy areas as the dependent variable. Two of these policy areas, welfare and garbage collection, together account for about one-fifth of total municipal spending. Tax collection is much smaller (0.4% of total spending), which makes an effect of cooperation in this area on total spending unlikely. Tax collection is included here for completeness only, because we delve deeper into this area below.

In Table 3, we use the same difference GMM method as in Table 2, including control variables and year dummies for all regressions. Once more, we also report estimates of fixed effects models. The dependent variable is again total municipal spending, in order to find out whether these results show similar outcomes as our main analysis. Because the theoretical case for endogeneity of the IMC variables used in Table 3 is

Table 3. Effect of IMC dummies and size increase on total municipal spending.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dummies fixed effects	Dummies GMM exogenous	Dummies GMM endogenous	Size increase fixed effects	Size increase GMM exogenous	Size increase GMM endogenous
Lagged dependent		0.19***	0.15***		0.19***	0.17***
		(4.92)	(3.96)		(4.93)	(3.38)
D_{welfare}	−0.02	−0.02	−0.05			
	(−0.97)	(−0.67)	(−0.57)			
$D_{\text{garbage collection}}$	0.02	0.02	0.14			
	(0.75)	(1.26)	(1.57)			
$D_{\text{tax collection}}$	−0.00	−0.00	−0.03			
	(−0.10)	(−0.08)	(−0.38)			
S_{welfare}				−0.01	−0.01	−0.03
				(−0.63)	(−0.80)	(−0.35)
$S_{\text{garbage collection}}$				0.01	0.01**	0.01
				(0.62)	(1.97)	(0.19)
$S_{\text{tax collection}}$				−0.00	0.00	0.01
				(−0.37)	(0.00)	(0.13)
Observations	3298	2450	2450	3298	2450	2450
Municipalities	388	388	388	388	388	388
Instruments		33	69		33	69
Hansen df		12	48		12	48
Hansen χ^2 value		7.7	51.4		7.8	48.4
Hansen p		0.81	0.34		0.80	0.46

Variables are expressed in logarithms; z-statistics based on robust standard errors in parentheses; $^{***}p < 0.01$, $^{**}p < 0.05$. Control variables included (see Column 4 of Table 2).
GMM: General Method of Moments.

less clear than in the case of IMC spending used in Table 2, as explained above, we also show the results for regressions where we treat IMC variables as exogenous (i.e., not as part of $w'_{i,t}$).

Whereas the fixed effects estimations in Table 2 showed a significant effect of IMC on spending, this is not the case in Table 3. Regardless of specification, in Table 3, cooperation shows no significant influence on total municipal spending, with one exception. In Column 5, there is a positive effect for cooperation in garbage collection on total spending. However, this effect is not robust. Collapsing the instrument matrix does not change much (Appendix 3a in the Supplemental material). We also test for delayed effects but find none (Appendices 3b and 3c).

The regressions in Table 3 include all municipalities, whether they cooperate in the relevant area or not. In effect, the analysis compares spending changes in municipalities that start cooperating in the relevant field with spending changes in municipalities that do not. This last category includes two different groups: municipalities that start cooperating in a different year in our data set, and municipalities that do not cooperate, in that field, in any year in our data set. Table 4 presents the outcomes of regressions run with only those municipalities that cooperate in the relevant policy field in at least 1 year within our data period. Thus, the control group now consists of municipalities that do not

Table 4. Effect of IMC dummies and size increase on total municipal spending; only municipalities that cooperate in the relevant policy field.

	(1)	(2)	(3)
	Welfare	Garbage collection	Tax collection
Panel A: IMC dummies			
Lagged dependent	0.15***	0.18***	0.15**
	(2.75)	(3.51)	(2.10)
D_{welfare}	−0.05**		
	(−2.06)		
$D_{\text{garbage collection}}$		0.04	
		(1.34)	
$D_{\text{tax collection}}$			−0.00
			(−0.15)
Observations	1014	1260	874
Municipalities	165	198	140
Instruments	43	43	43
Hansen df	24	24	24
Hansen χ^2 value	22.8	18.4	24.8
Hansen p	0.53	0.78	0.42
Panel B: IMC size increase			
Lagged dependent	0.17***	0.20***	0.10
	(3.08)	(3.59)	(1.38)
S_{welfare}	−0.03		
	(−1.10)		
$S_{\text{garbage collection}}$		0.00	
		(0.27)	
$S_{\text{tax collection}}$			0.04
			(1.32)
Observations	1014	1260	874
Municipalities	165	198	140
Instruments	43	43	43
Hansen df	24	24	24
Hansen χ^2value	20.3	29.0	15.6
Hansen p	0.68	0.22	0.90

Variables are expressed in logarithms; z-statistics based on robust standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$. Difference GMM two-step estimation using lags 2–3. Control variables included (see Column 4 of Table 2). Cooperation variables treated as endogenous.
IMC: Intermunicipal cooperation.

cooperate in a particular year but do cooperate at a different moment. This makes both groups more comparable.

Panel A of Table 4 measures IMC through dummy variables, Panel B through the (population) size increase realised by cooperating. Again, there is no significant effect of IMC on spending,[6] with one exception. The dummy variable indicating whether a municipality cooperates in the field of welfare provision has a significantly negative coefficient. However, this result is not robust: it is not found in Panel B of Table 4, nor in regressions with collapsed instrument matrices (Appendix 4b in the Supplemental material).

Impact of municipality size

Having established that cooperation has no significant effect on municipal expenditure levels *on average*, we ask whether such an effect might exist for specific population sizes. One might surmise, e.g., that very small cooperating municipalities are more likely to profit from potential economies of size than large municipalities. To investigate this, we interact IMC spending with number of inhabitants and include this variable in the regression of Table 2, Column 4. The regression results are shown in Appendix 1 in the Supplemental material. Using these results, we created Figure 2. The downward sloping solid line in Figure 2 shows the marginal effect of IMC spending on total spending for different population sizes. The bar chart at the bottom of the Figure represents a histogram of the number of observations of different (log) population size. These show that the most relevant part of the graph runs roughly from 9 to 12. Outside this range, there are few observations.

Using a strict 95% confidence level while interpreting Figure 2 (dotted lines), we conclude that the effect of IMC on total spending is not statistically different from zero for any municipal size. If we accept a slightly lower confidence level, however, we might deduce that an increase in cooperation raises total spending for the smallest municipalities.

The above interpretation of Figure 2 is based on the assumption that the marginal interaction effect is linear. However, per capita spending is often thought to follow a u-curve (and efficiency an inverted u-curve), with small and large organisations showing high spending levels and lowest spending levels at intermediate sizes. Although no firm evidence for such a u-curve seems to exist, we use a binning method to allow for non-linearity

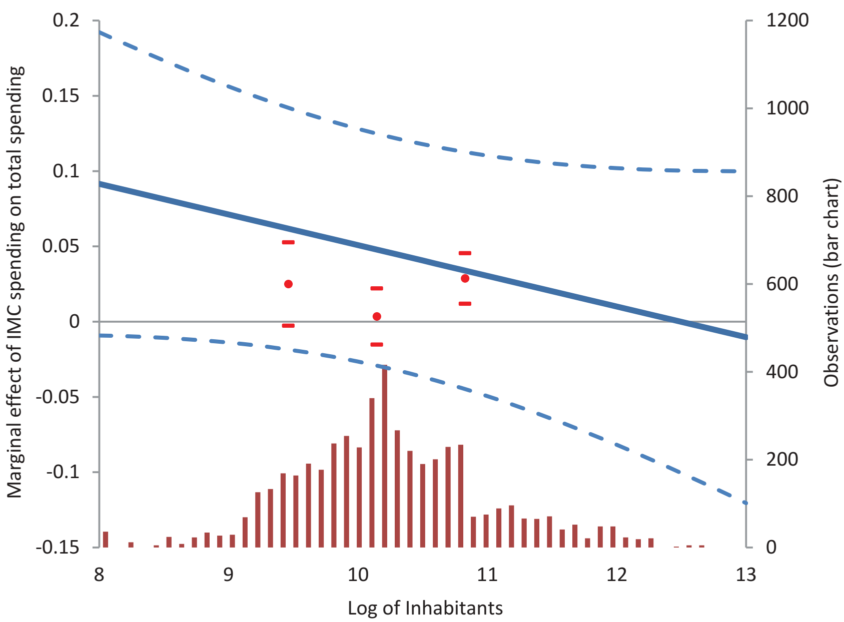

Figure 2. Marginal effect of IMC spending on total spending for different population sizes.

(Hainmueller, Mummolo, and Yiqing 2017). We estimate marginal effects for different groups of observations, sorted by number of inhabitants.

The red dots in Figure 2 (and their 95% confidence intervals indicated by horizontal red bars) show the marginal effect for the smallest third of the municipalities, for the middle third and for the largest third, respectively. Together, these dots suggest a u-curve, but as the confidence intervals surrounding these dots overlap, linearity cannot be rejected. Smaller municipalities (the smallest 33%) seem to spend slightly more as a consequence of an increase in IMC. A 10% increase in IMC spending would result in an increase of total spending of around 0.3% for these municipalities. A similar expenditure-increasing effect is found for the largest 33% of all municipalities. For mid-sized municipalities, we see no effect of IMC on municipal spending.

Effect of IMC on tax collection expenditures

Results of earlier research in the Netherlands suggest that cooperation in the field of tax collection increases cost-efficiency (Niaounakis and Blank 2017). As explained above, such an effect is unlikely to affect total spending, due to the small share of tax collection spending in the total budget of a municipality. Tables 3 and 4 confirm this. This area is of particular interest, because work processes are highly automated. This means that fixed costs (computer hardware and software) are relatively high. If there are policy fields where economies of size exist, this is probably one of them.

To delve deeper into this, we regress not total spending but spending associated with tax collection on IMC indicators. Data limitations restrict us from also applying this method to the other policy areas. For tax collection, the necessary data on spending and control variables are available. All Dutch municipalities levy a property tax, which is the main source of local tax revenue. Additionally, municipalities are allowed to levy other taxes, but only those that are enshrined in national law. Costs associated with tax collection depend largely on the number of taxable properties in a municipality and on the types of taxes that are levied. To capture this, we add four extra control variables. These measure the number of residential properties, the per capita value of non-residential properties and whether or not a municipality taxes dog ownership or tourism. Because tax collection (as opposed to tax policy) rarely involves political choices, we do not include political controls here.

Table 5 shows the results. We use IMC dummies for the first two regressions, and size increase through cooperation for the last two regressions. Columns 1 and 3 present results from regressions that treat IMC as exogenous. These suggest that cooperation results in significant reductions in per capita expenditures in this area. Municipalities that cooperate manage to reduce spending on this task by roughly 15% on average (Column 1).

Table 5. Effect of tax cooperation on tax collection expenditure.

	(1)	(2)	(3)	(4)
	Dummy exogenous	Dummy endogenous	Size increase exogenous	Size increase endogenous
Lagged dependent	0.43***	0.37***	0.43***	0.34***
	(6.31)	(4.19)	(6.37)	(4.54)
$D_{\text{tax collection}}$	−0.15***	−0.15		
	(−2.93)	(−0.59)		
$S_{\text{tax collection}}$			−0.06**	0.13
			(−2.50)	(0.76)
Observations	2487	2487	2487	2487
Number of code	389	389	389	389
Number of instruments	38	59	38	59
Hansen df	21	42	21	42
Hansen χ^2 value	26	51.6	25.8	46.2
Hansen p	0.21	0.15	0.21	0.30

Variables are expressed in logarithms; *z*-statistics based on robust standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$. Difference GMM two-step estimation using lags 2–5. Control variables included. See Appendix 5b in the Supplemental material for results with collapsed instrument matrix.

Alternatively, doubling the population that is served through cooperation reduces spending by 6%. Fixed effects estimations yield similar outcomes (Appendix 5a in the Supplemental material). Columns 2 and 4 of Table 5, however, paint a different picture. Here, IMC is treated as endogenous, and no significant effect is found.

Analogous to Table 4, we repeat the regressions in Table 5, excluding municipalities that do not cooperate in tax collection in any year in our data set. Thus, we compare municipalities that cooperate with municipalities that do not cooperate in that year, but that do cooperate in at least 1 year in the period under study. Consequently, both groups are more comparable.

Table 6 shows the results. Now, all specifications show a significantly negative effect of IMC on spending. Using fixed effects yields the same result (Appendix 5a). As shown by the test statistics (low Hansen *p* values), however, the instruments in the estimates with endogenous IMC specification (Columns 2 and 4 of Table 6) may not be valid. Thus, if the IMC variables are exogenous, it reduces spending. If they are endogenous, we cannot tell. As argued above, exogeneity is more likely here than in regressions where IMC spending is the independent variable, in particular when the independent variable is scale increase through IMC. Therefore, we believe that tax cooperation reduces spending in that area.

Effect of IMC on service levels

Our results so far suggest that IMC does not affect total spending for the average municipality. For small and for large municipalities, however, IMC may lead to slightly higher spending levels. And for specific policy fields like

Table 6. Effect of tax cooperation on tax collection expenditure; only municipalities that cooperate in the relevant policy field.

	(1)	(2)	(3)	(4)
	Dummy exogenous	Dummy endogenous	Size increase exogenous	Size increase endogenous
Lagged dependent	0.41***	0.31***	0.42***	0.29***
	(4.88)	(3.04)	(5.04)	(3.36)
$D_{\text{tax collection}}$	−0.14***	−0.21***		
	(−2.71)	(−2.64)		
$S_{\text{tax collection}}$			−0.06**	−0.13***
			(−2.33)	(−2.82)
Observations	891	891	891	891
Number of code	141	141	141	141
Number of instruments	38	59	38	59
Hansen df	21	42	21	42
Hansen χ^2 value	25.7	63.6	25.5	61.4
Hansen p	0.22	0.02	0.23	0.03

Variables are expressed in logarithms; z-statistics based on robust standard errors in parentheses; $^{***}p < 0.01$, $^{**}p < 0.05$. Difference GMM two-step estimation using lags 2–5. Control variables included. See Appendix 6 in the Supplemental material for results with collapsed instrument matrices.

tax collection, spending may be reduced through IMC. What should we make of this? IMC-induced spending increases in small municipalities could point to increases in service levels. Possibly, small municipalities are unable to carry out certain tasks satisfactorily when operating alone, while cooperation enables more professional processes with higher standards. Moreover, savings from cooperation in, e.g., tax collection may be used to improve services in different fields.

As explained, municipal output levels cannot be measured satisfactorily, so we cannot test this directly. Instead, we test whether changes in IMC spending result in changes in house prices, building on evidence that suggests that public services capitalise into house prices (Hilber, Lyytikäinen, and Vermeulen 2011; Allers and Vermeulen 2016). A positive effect would suggest that IMC improves public service levels.

Table 7 presents the results of regressions with house prices as the dependent variable. Because deteriorating service levels could increase the desire for cooperation, we run two regressions. In Column 1, we treat IMC spending as exogenous. In Column 2, we treat IMC spending as endogenous to house prices, and instrument it as such. The regression in Column 1 uses the same bias corrected LSDV estimator as Allers and Geertsema (2016) utilise when studying the effect of amalgamations on house prices. The regression in Column 2 uses difference GMM.

As expected, Column 1 of Table 7 shows that average house prices within a municipality strongly depend on their levels in the previous year. The results in Column 2 show that past changes in house prices are not as strong a predictor for current changes, but still significant. More importantly though, the results of both regressions clearly indicate that spending on

Table 7. Effect of IMC spending on house prices.

	(1)	(2)
	Bias corrected LSDV	Difference GMM
Lagged dependent	0.97***	0.32*
	(27.62)	(1.72)
IMC spending	−0.00	0.00
	(−0.65)	(0.48)
Observations	2733	2349
Number of code	366	366
Number of instruments		43
Hansen df		34
Hansen χ^2 value		45.3
Hansen p		0.10

Variables are expressed in logarithms; *z*-statistics based on robust standard errors in parentheses; ***p < 0.01, *p < 0.1. Difference GMM two-step estimation for Equation (2) using lags 2–4.
IMC: Intermunicipal cooperation; GMM: General Method of Moments.

IMC has no impact on house prices. The coefficients are zero in both regressions. These outcomes remain unchanged if we utilise lagged values of IMC spending to account for a potential delayed effect (Appendix 7 in the Supplemental material). Note, however, that the Hansen *p* value in Column 2 of Table 7 (and in Column 1 in Appendix 7) indicates that the instruments may not deal satisfactorily with endogeneity.

Thus, we find no evidence for the hypothesis that changes in IMC spending affect service levels. Obviously, this does not prove that IMC has no such effect. It only shows we cannot observe any. One could surmise, e.g., that IMC improves services for households that do not own their home. Recall that the average house prices we use are calculated using transaction data of owner-occupied housing.

Conclusion

We study the effects of IMC on expenditure levels of Dutch municipalities in 2005–2013. We measure IMC in three different ways: by per capita spending through IMC, by dummies for the existence of IMC in particular policy fields and by the increase in operating size which results from cooperating in these fields. Whatever measure we use, our results provide no empirical basis for the assumption, common among policymakers, that IMC reduces spending or increases efficiency. We find that IMC does not affect total spending for the average municipality. For small and for large municipalities, however, IMC might lead to slightly higher spending.

This does not mean that IMC can never reduce spending. We pay special attention to a particularly capital intensive policy area: tax collection. If economies of size exist at all, they are likely to be found here. We find that spending in this field may indeed be considerably reduced through

IMC. Because of the small share of tax collection in total municipal spending, it is not surprising that cooperation in this field does not affect total municipal spending in our regressions.

The desire to cut back spending is not the only possible motivation for cooperation among municipalities. IMC may alternatively be aimed at improving public services. The IMC-induced spending increases we find for some groups of municipalities could be driven by improvements of public services, especially in small municipalities. Possibly, small municipalities are unable to carry out certain tasks satisfactorily when operating alone, while cooperation enables more professional processes with higher standards.

Alternatively, higher spending as a result of IMC could point to less efficiency. Allers and van Ommeren (2016) present evidence that IOs are less effective in minimising costs. They attribute this to the introduction of extra hierarchical layers through IMC, and the limited influence of municipality governments on IO boards, both of which reduce monitoring. As municipal output levels cannot be measured satisfactorily, we cannot test this in a direct way. Instead, we use an indirect indicator.

Previous studies show that municipalities that receive more grant money from the central government see a proportional rise in house prices, presumably because the extra money is spent on public services that make a municipality more attractive to potential homebuyers. The same may be expected in municipalities that can spend more on public services because of savings resulting from IMC. We investigate whether changes in IMC spending result in corresponding changes in house prices. A positive effect would suggest that IMC improves public service levels. However, we find no effect of IMC on house prices. Of course, this does not prove that service provision is not improved by IMC. We have no evidence that it does. If IMC does not reduce spending or improve service levels, it does not enhance efficiency.

This study adds to the as yet limited body of empirical studies on the financial effects of IMC. We extend the analysis beyond garbage collection, which dominates previous studies. We use different IMC indicators, differentiate according to municipal size and attempt to indirectly test whether IMC affects service provision. To what extent the results may be generalised to different institutional settings is unclear. Bel and Warner (2015) stress that type of public service, output or population size and institutional design are of crucial importance in obtaining cost savings from cooperation. Therefore, more research is needed in different settings, to enable researchers to derive the factors that determine success. This would enable them to inform policymakers about the expected effects of cooperation in specific cases. This would be especially useful for governments that are considering whether to cooperate or to amalgamate in order to increase operating size.

For now, policymakers considering IMC should realise that cost savings may be elusive and that spending may actually go up instead of down.

Much will depend on the production technology used. For capital-intensive services like tax collection, prospects are best. In social services, economies of size may not exist or be negligible.

Notes

1. We use realised, not budgeted, amounts.
2. We do not report the regression results; they are very similar to those in Allers and Geertsema (2016).
3. In appendices, we also show the outcomes for regressions with collapsed instrument matrices for lagged dependents and $w'_{i,t}$. These results can be compared with the outcomes from the non-collapsed regressions we report, as a safeguard against potential overfitting. In order to limit the number of instruments, we restrict the number of lags used. For the lagged dependent, we instrument the differences with lags 1 and 2 of the differences. For $w'_{i,t}$, we instrument the difference with lags 2 and 3 of the difference. Since the lagged dependent already contains $y_{i,\ t-1}$, this means that both the lagged dependent and $\Delta\delta w'_{i,t}$ are instrumented with differenced data from the same levels: $t-2$ and $t-3$. We have tested multiple specifications with different lag levels before choosing this specification. Using extra lag levels as instruments does not change the outcomes but does result in less favourable Hansen test results. For regressions in later tables, we sometimes use different lag levels, but we always indicate below the tables which lagged levels are used, and we always use the same levels for both the lagged dependent and $w'_{i,t}$.
4. The Hansen χ^2 values and the Hansen p values in Table 2 suggest that our instruments are valid. Based on the Arrelano–Bond AR(2) test, we can also conclude that using lag 2 (and up) is safe, since all these tests strongly indicate that there is no second-order autocorrelation present while using the model with these specifications. Values for all AR(2) tests from all regressions in first differences presented show z scores close to 0 and probabilities between 0.8 and 1. We will not report this again for other regressions.
5. The coefficient of approximately 0.2 shows that our dependent variable is not stationary, confirming that a difference GMM approach is preferable over a system GMM approach, since one of the key assumptions for system GMM is violated (Roodman 2009).
6. Using a fixed effects model instead of GMM finds no significant effect either (Appendix 4a in the Supplemental material).

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